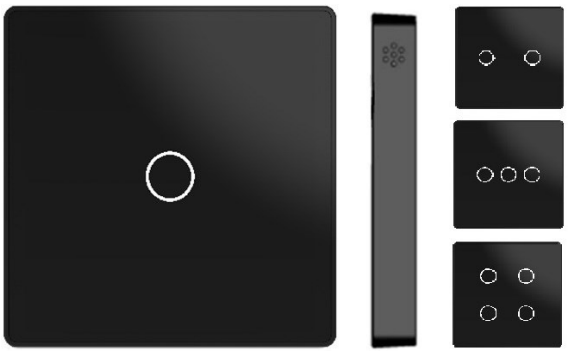
ICT-040X-04A Series Capacitive Touch Panels Datasheet



1 Introduction

The ICT-040X-04A series capacitive touch panels are elegantly designed devices tailored for modern workplaces and smart homes. Featuring a 4-inch capacitive touch interface with customizable button options, they offer versatility for a wide range of applications.

With a built-in buzzer, the ICT-040X-04A Capacitive Touch Panel (CTP) family ensures responsive and intuitive interaction through tap detection. Its stylish design and dependable performance make it an excellent choice for controlling lighting, climate, security, and other automation systems in smart environments.

Attributed to the lack of mechanical components in its capacitive touch switches, the ICT-040X-04A CTP boasts a significantly longer operational lifespan compared to traditional mechanical switches.

1.1 Features

- Capacitive touch technology supports one, two, three or four touch buttons.
- A built-in buzzer that can be set to either silent mode or beep when a touch is detected
- 8-bit microcontrollers equipped with a wide range of features in small packages
- Multiple Mounting options include flush mount, glass mount and electric box mount.
- Sealed design for optimal performance and wear resistance; resistant to fading and deformation; long life span.
- Highly reliable, making it an ideal replacement for various types of panels, including metal keypads and membrane keypads
- Low Power Consumption

1.2 Typical Applications

- Smart Home Systems: Lighting Control
- Industrial Applications: Control Panels

2 Part Number/Ordering Information/Package Content

Part No.	Description
ICT-0401-04A	Intelligent Capacitive Touch 4 inch 1-Button Device
ICT-0402-04A	Intelligent Capacitive Touch 4 inch 2-Button Device
ICT-0403-04A	Intelligent Capacitive Touch 4 inch 3-Button Device
ICT-0404-04A	Intelligent Capacitive Touch 4 inch 4-Button Device
PA-0015-00A	Accessory, Rear Cover Mounting Bracket (Included in package, optional for additional purchases)
PA-0014-00A	Accessory, Wall Box Mounting Bracket (Not included in package, optional for purchases)
LA-0301-01A	Accessory, RJ12-JST Cable (5m) for ICT40 device (Not included in package, optional for purchases)

Table 1 - Part Number/Ordering Information

	Part No.	Description	Quantity
Device	ICT-0401-04A/ ICT-0402-04A/ ICT-0403-04A/ ICT-0404-04A	ICT40 Device	1
Mounting Accessory	PA-0015-00A	Rear Cover Mounting Bracket	1

Table 2 - Package Content

Table of Contents

3 Hardware Features

The ICT-040X-04A CTP40 features a 4-inch capacitive touch panel with dimensions of 89.1mm (L) x 89.1mm (W) x 12mm (T).

Figure 1 - ICT-0404-04A: 4 Button Device

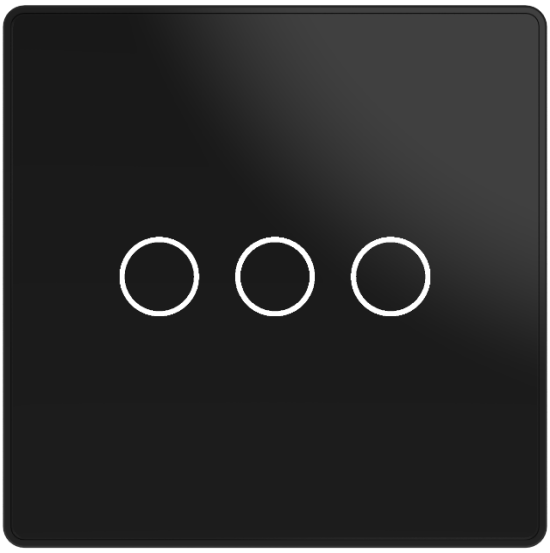


Figure 2 - ICT-0403-04A: 3 Button Device (Front View)

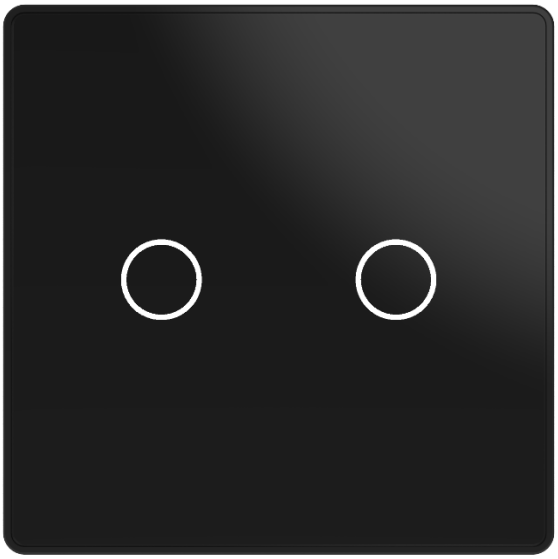


Figure 3 - ICT-0402-04A: 2 Button Device (Front View)

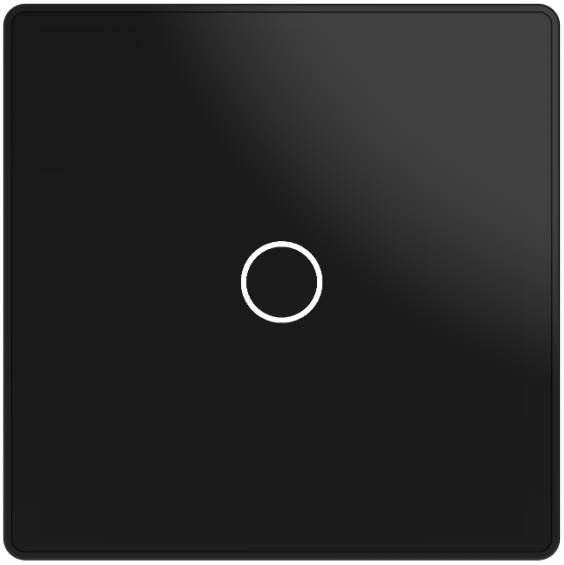


Figure 4 - ICT-0401-04A: Single Button Device (Front View)

3.1 PCBA Profile

Dimensions of PCBA: 80mm (L) X 77mm (W) X 1.6mm (T) with maximum component height of 3.7mm (H).

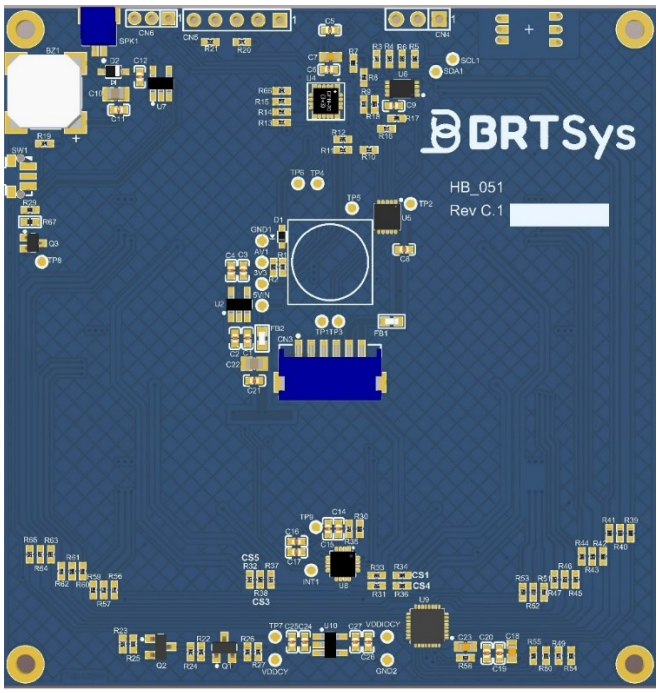


Figure 5 - ICT-040X-04A PCBA (Front View)

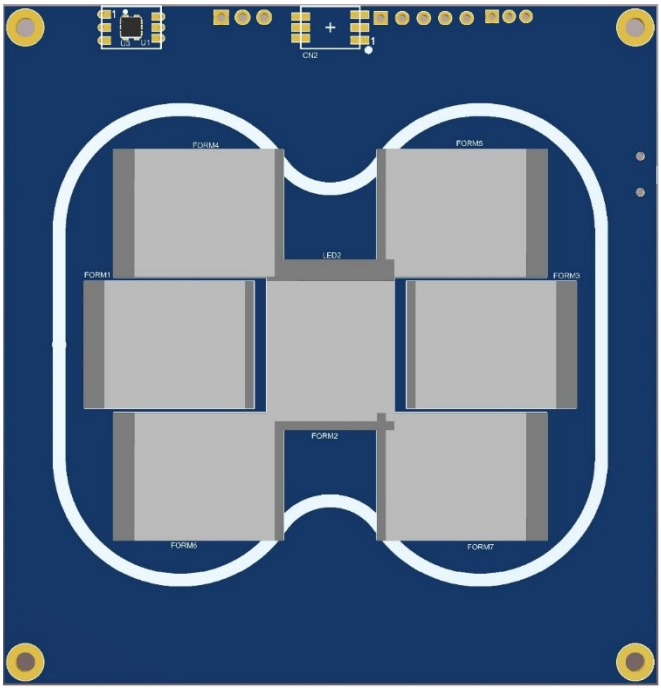


Figure 6 – ICT-040X-04A PCBA (Back View)

3.1.1 Key Features

- 4-inch capacitive touch interface
- Supports one, two, three or four touch buttons
- EFM8BB21F16G-C-QFN20R microcontroller
- CY8CMBR3108 capacitive touch controller
- Integrated system indicator LED
- Built-in audio buzzer for sound notifications
- 4-pin 1.5mm pitch JST header, accepting 5V input power supply and featuring RS485 interface for external devices

3.2 PCB Profile

The printed circuit boards are a four-layer design stacked as follows:

1. Layer 1: Routing & Component placement (Top)
2. Layer 2: Routing layer
3. Layer 3: Routing layer
4. Layer 4: Routing & Component placement (Bottom)

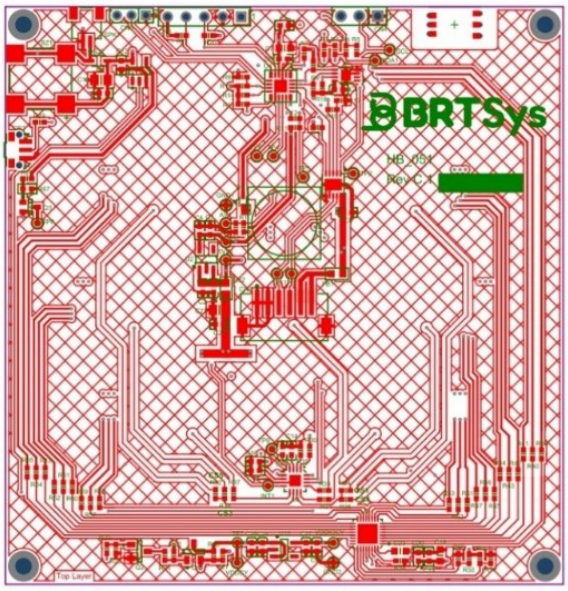


Figure 7 - ICT-040X-04A PCB (Top Layer)

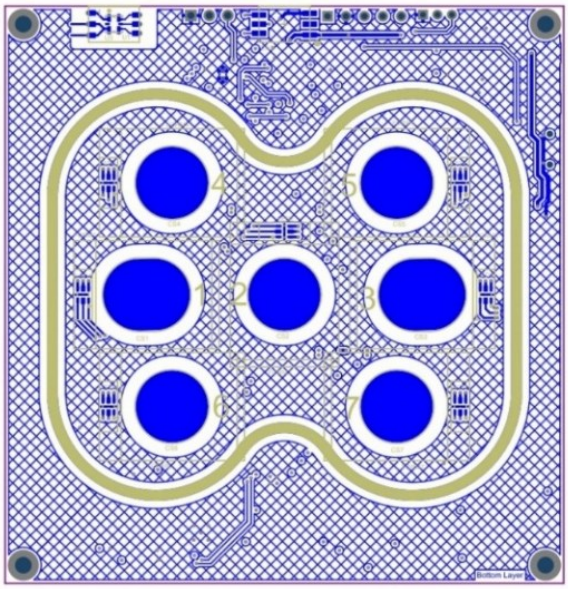


Figure 8 - ICT-040X-04A PCB (Bottom Layer)

3.3 Connectors

Connectors are described in the following section.

- **CN3 – Input Power with RS485 Interface**

  This 6-position 1.5mm pitch right-angle JST connector supports the connection to external devices via RS485 interface.

Pin No.	Name	Type	Description
1	GND	P	Ground
2	GND	P	Ground
3	A/Y	I/O	Positive terminal for differential signals
4	B/Z	I/O	Negative terminal for differential signals
5	5VIN	P	5V input power
6	5VIN	P	5V input power

Table 3 - CN3 Pinout

- **CN5 – Debug/ Programming Header**

  The 5-postion 2.54mm pitch header is used for debugging and programming the onboard EFM8BB2 microcontroller.

Pin No.	Name	Type	Description
1	5VIN	P	5V input power supply
2	GND	P	Ground
3	C2CK	I	Debugger clock signal output line
4	C2D_M	I/O	Debugger data output line
5	VDD_3V3	P	3V3 output power supply

Table 4 - CN5 Pinout

4 Board Schematics

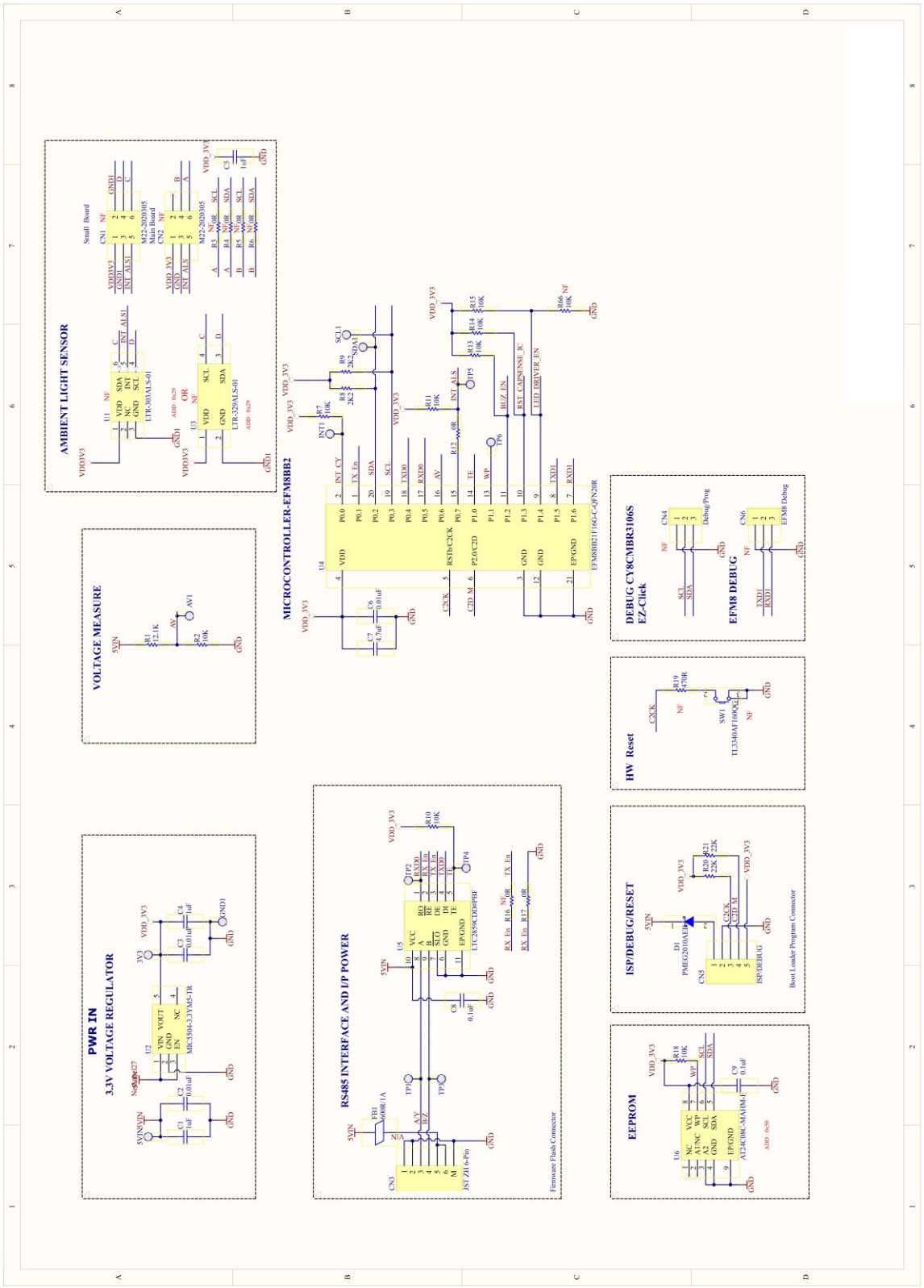


Figure 9 - EFM8BB2 Microcontroller

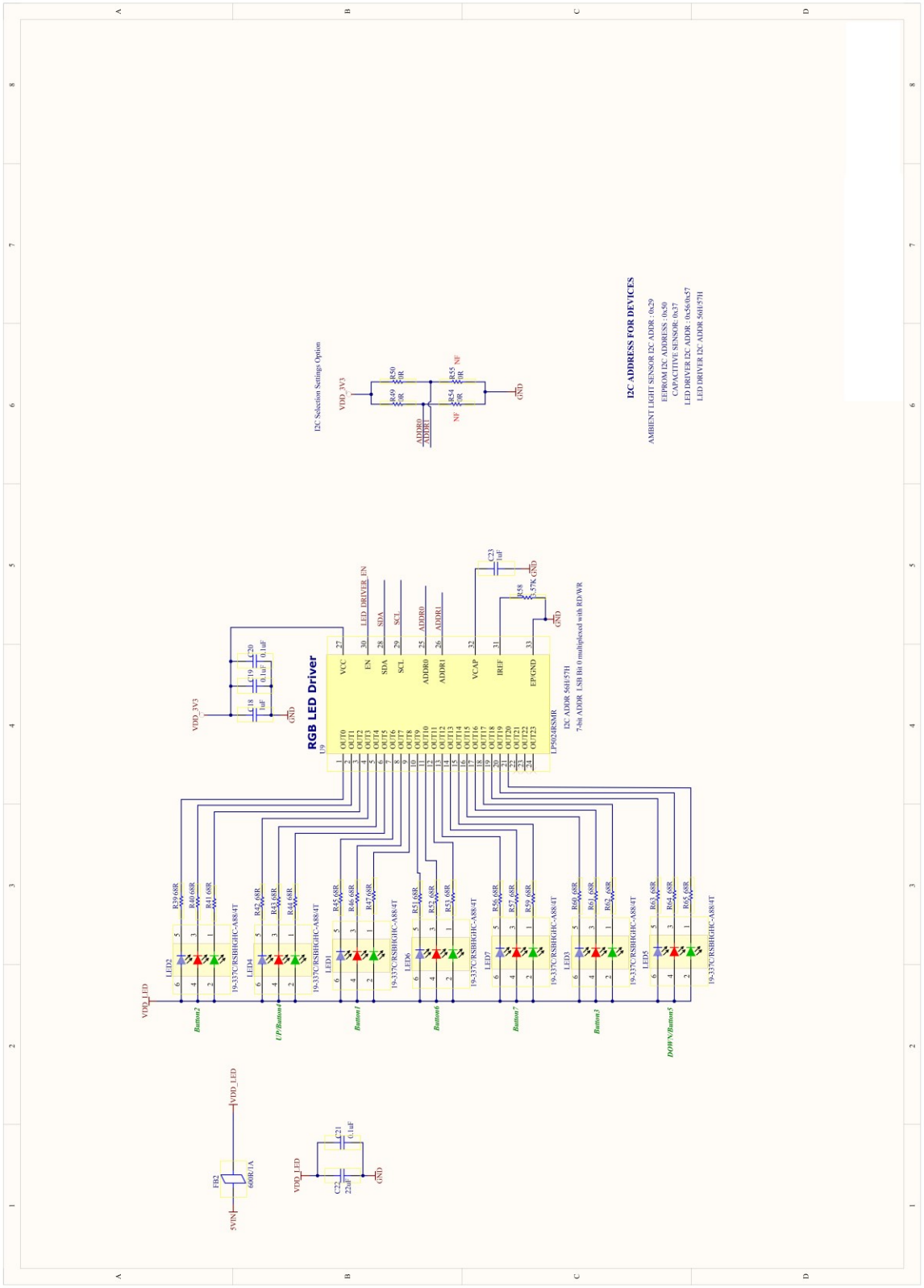


Figure 10 - LED System Indicator

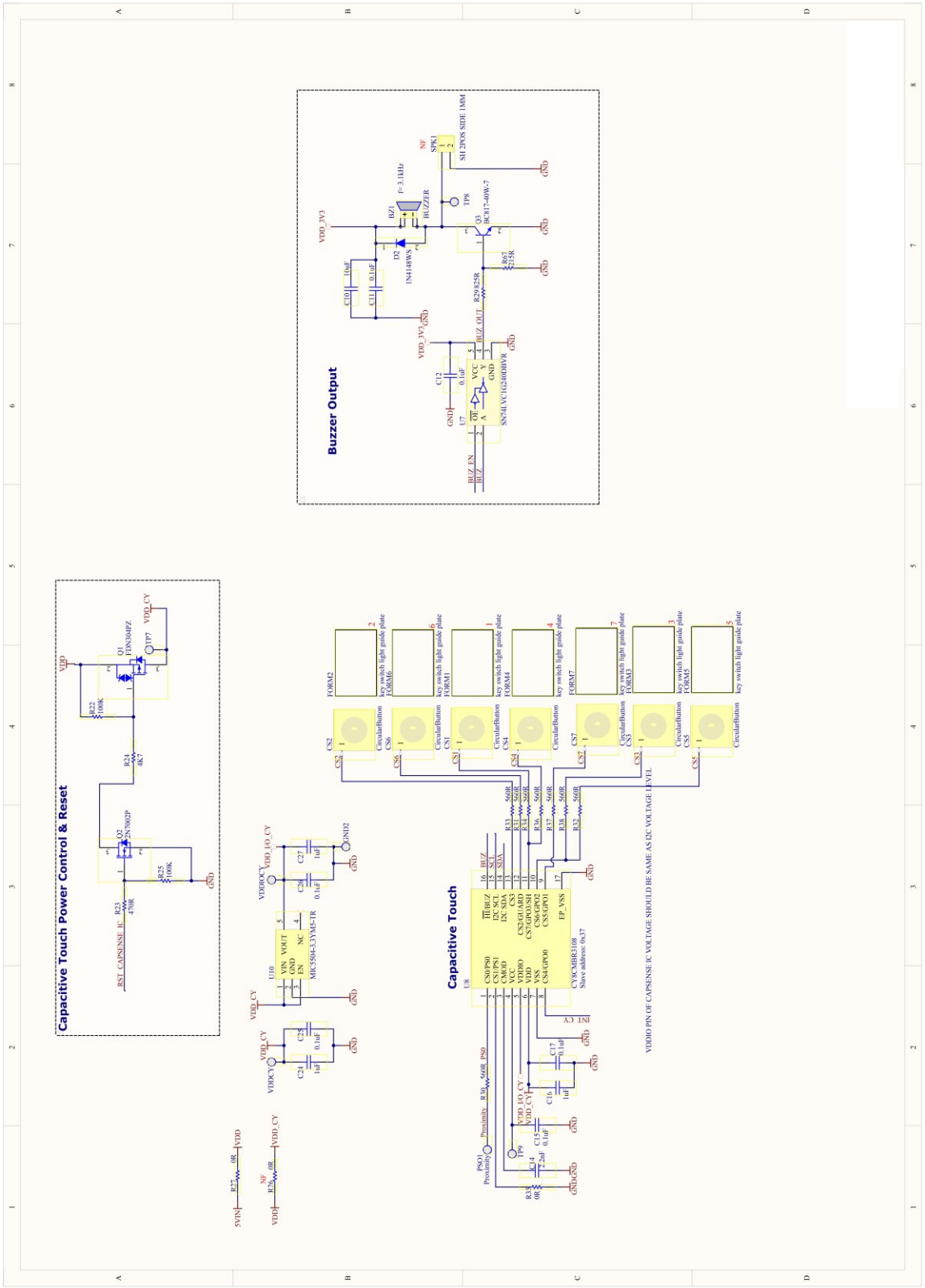


Figure 11 - Capacitive Touch Interface

5 Device Description and Configuration

5.1 Power Supply

Power is delivered through the JST6 port located at the back of the ICT-040X-04A CTP. The supply voltage is 5V DC, with a nominal operating current of approximately 60mA.

5.2 Microcontroller

EFM8BB2 is a versatile 8-bit microcontroller designed with a comprehensive set of features:

- Pipelined 8-bit C8051 core with a maximum operating frequency of 50 MHz
- Up to 22 multifunction I/O pins, tolerant to 5V
- 12-bit Analog-to-Digital converter (ADC)
- Two low-current analog comparators with built-in DAC for reference input
- Integrated temperature sensor
- 3-channel PWM/PCA with special hardware kill/safe state capability
- Five 16-bit timers
- Two UARTs, SPI, SMBus/I2C master/slave and I2C slave
- Priority crossbar for flexible pin mapping

Refer to the EFM8BB2 Datasheet for detailed hardware specifications of the MCU.

5.3 Capacitive Touch Controller

The CY8CMBR3108 is a register-configurable CapSense Express controller that operates without the need for firmware development. It offers:

- Patented CSD sensing algorithm
- High sensitivity (0.1pF)
- Low power consumption
- EZ-Click customizer tool
- Advanced user interface

For detailed hardware specifications of the capacitive touch controller, please refer to the CY8CMBR3108 datasheet.

5.4 RGB LED Driver

The LP5024 is a 24-channel constant current sink LED driver with built-in color mixing and brightness control. Its pre-configuration streamlines software development. Each channel is equipped with integrated 12-bit, 29kHz PWM generators, providing smooth, vibrant LED colors without generating audible noise.

The I2C address of the LED driver is set to 0x2B. If the user wishes to change the address, they can do so by configuring the ADDR0 and ADDR1 pins on the driver, as shown in the table below.

ADDR1	ADDR0	Address
GND	GND	0x28
GND	VCC	0x29
VCC	GND	0x2A
VCC	VCC	0x2B

Table 5 - Setting I2C Address for LP5024

Please refer to LP5024 datasheet for detailed hardware specifications of the LED driver.

5.5 6-position JST Connector

Power and data are provided through the 6-position JST connector located at the rear of the display module, which interfaces with an external host controller via RS485.

Figure 12 and **Table 6** illustrates the pin orientation and functions of the 6-position JST connector.

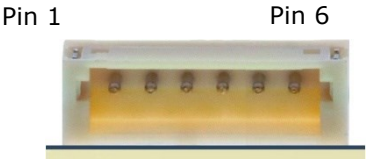


Figure 12 - JST6 Port

Pin Number	1,2	3	4	5,6
Function	Ground	RS485 A/Y	RS485 B/Z	5VIN

Table 6 - JST6 Port Pin Function

5.6 Buzzer

The buzzer gives developers the option to provide audible feedback, helping users to recognize and confirm their touch interactions with the button.

5.7 Button Control and Operation

Developers can tailor the button behavior using preloaded firmware, allowing for different actions based on various gestures (e.g., single, multiple, or long taps).

5.8 LED Status Indicator

The LED status indicator comprises seven RGB LEDs controlled by the LP5024 LED driver. This 24-channel constant current sink driver features integrated color mixing and brightness control, with pre-configuration to simplify software development.

With application specific firmware, developers can customize LED behavior—such as on, off, blinking, color mixing, or brightness—to indicate various button and system states.

5.9 JST6-RJ12 Cable

A JST6-RJ12 cable, serving as both the input power source and RS485 interface to the external host, is available for purchase separately (not included in the package).

One end of the cable consists of a JST 1.5mm 6-position receptacle while the other end is fitted with a standard RJ12 plug.

Figure 13 and Table 7 illustrates the pin orientation and functions of the JST receptacle and RJ12 plug.

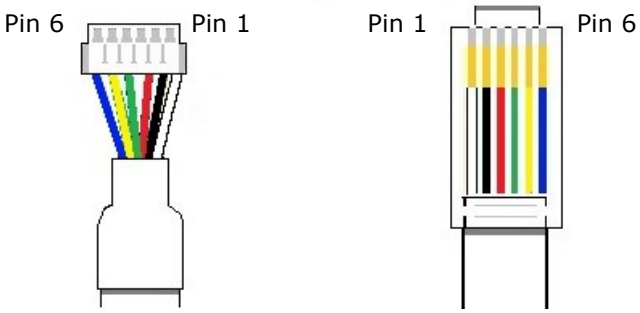


Figure 13 - JST6-RJ12 Cable Pin Orientation

Pin Number	1,2	3	4	5, 6
Function	GND	RS485 A/Y	RS485 B/Z	DC5V IN

Table 7 - JST6-RJ12 Cable Pin Function

The JST receptacle connects to the ICT-040X-04A module, facilitating communication with an external host and receiving power from it. The JST6-RJ12 cable establishes a connection to the external host, supporting both data transmission and power delivery.

For development purposes, developers can use a BRT System's **LDS Bus USB Adaptor** designed for RS485 device applications. Refer to the purchase link below for the adaptor and an image illustration in Figure 14.

- BRT Systems – LDS Bus USB Adaptor

Figure 14 - LDS Bus USB Adaptor

Please refer to Figure 15 for connection details when using the LDS Bus USB Adapter.

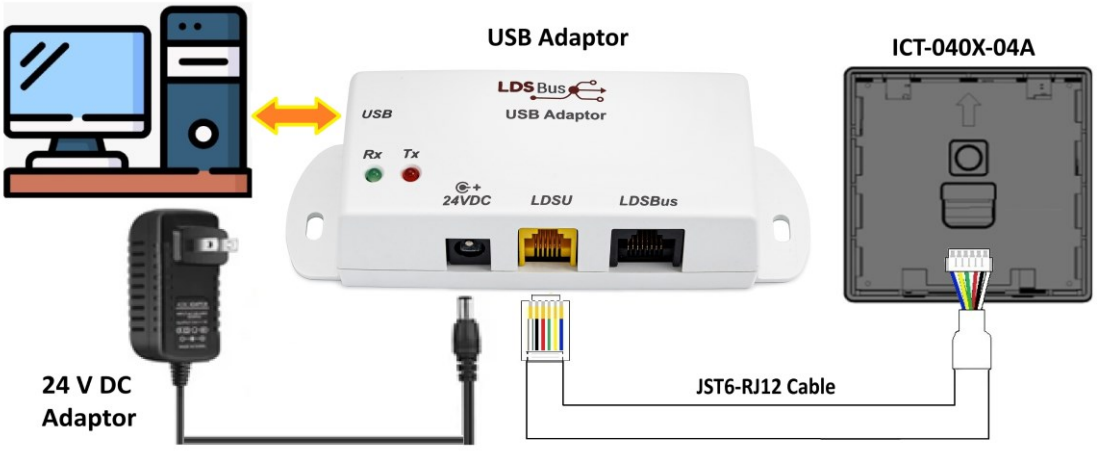


Figure 15 - Connection to PC and Supply via LDS Bus USB Adaptor

6 Mounting Options

ICT-040X-04A CTP offers four mounting options:

- Wall Mounting
- Glass Mounting
- 86 Type Electrical Box Mounting
- Wall Box Mounting

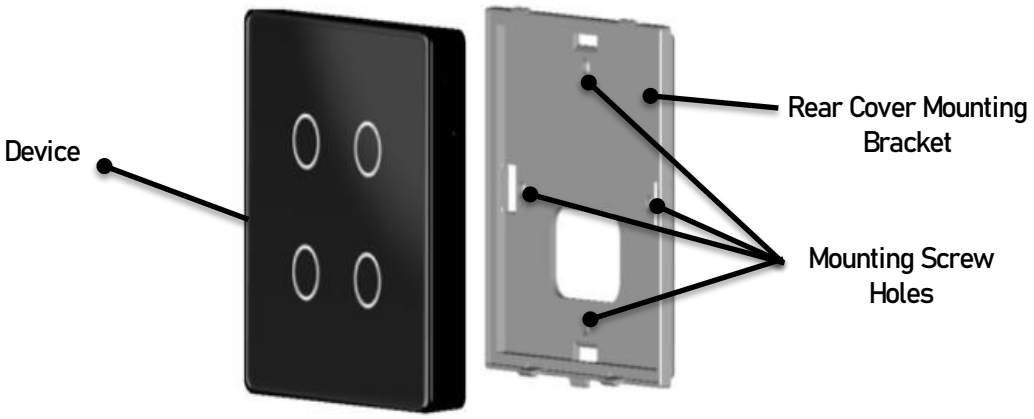


Figure 16 - Wall Mounting

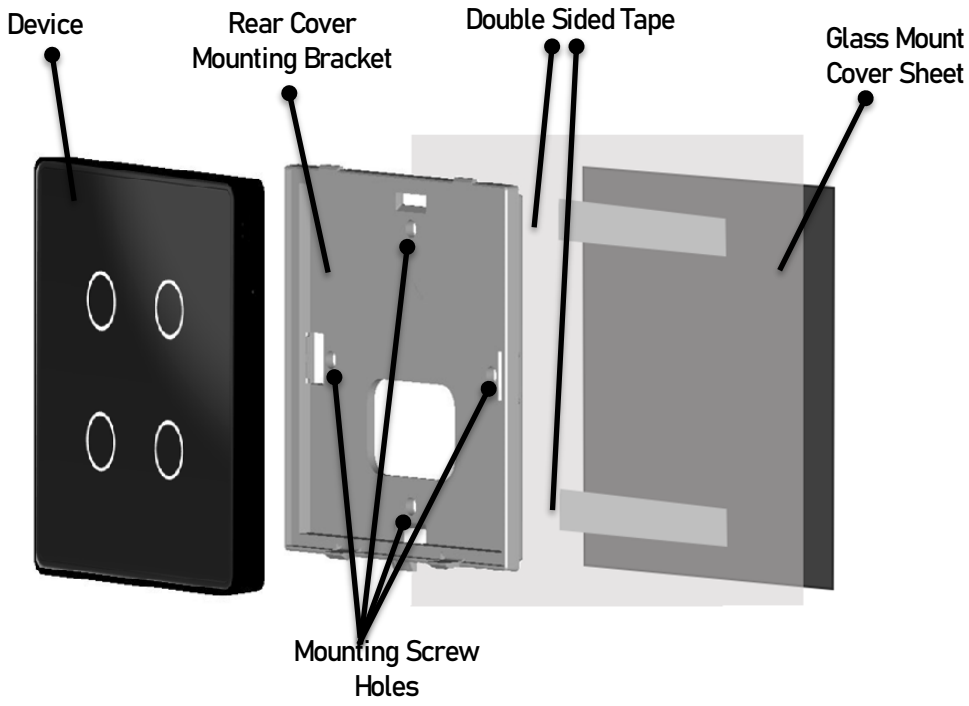


Figure 17 - Glass Mounting

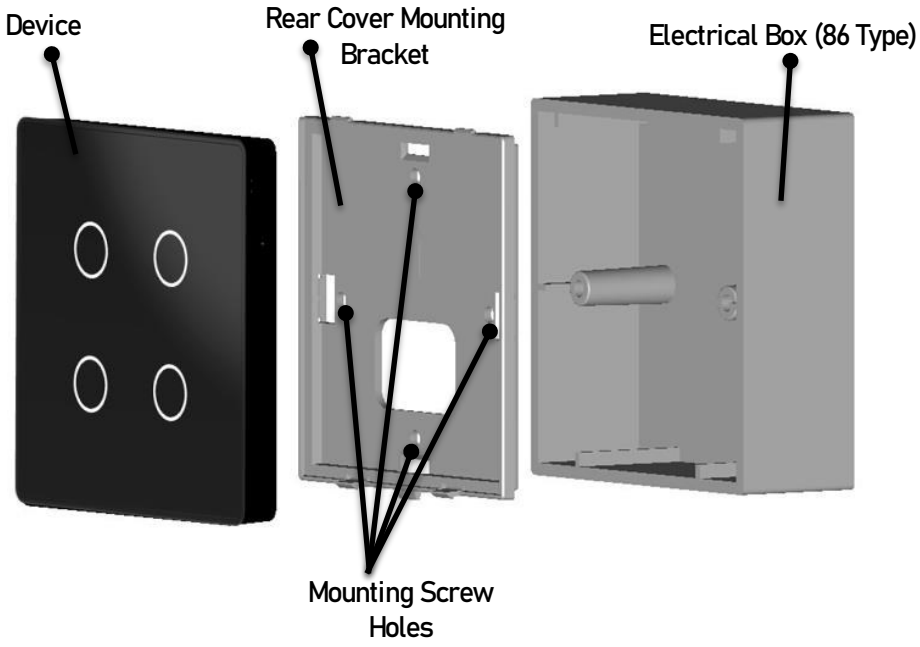


Figure 18 - Electrical Box (86 Type) Mounting

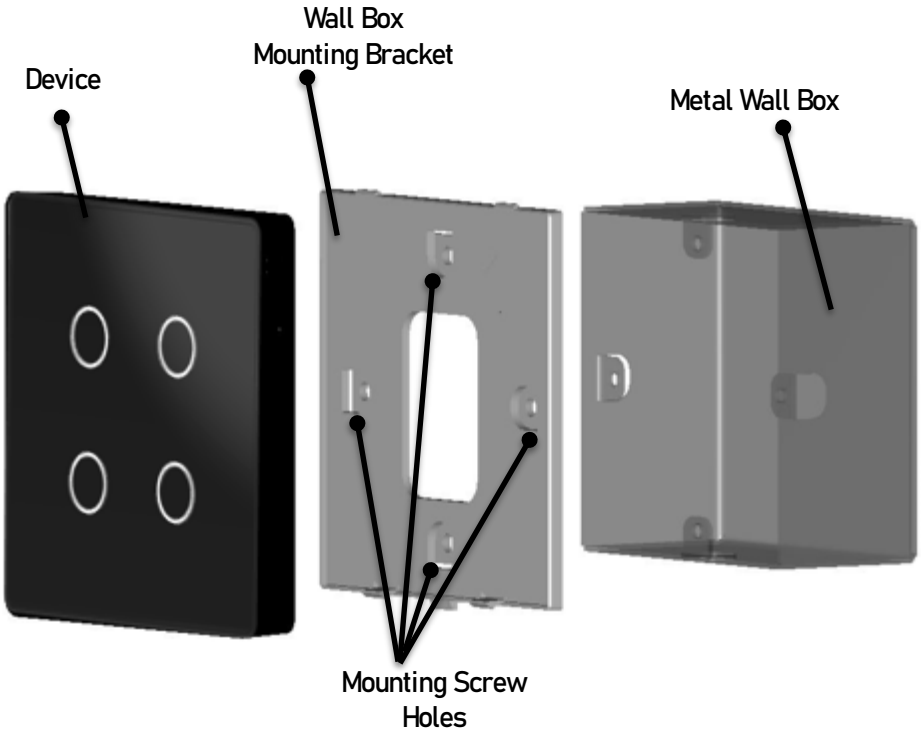


Figure 19 - Wall Box Mounting

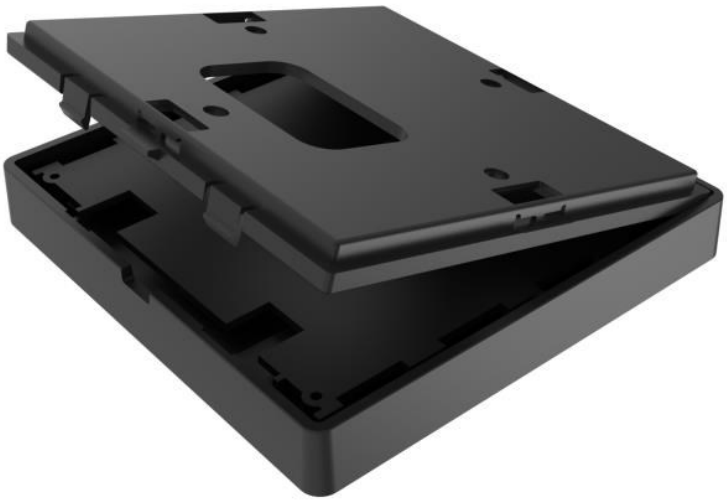


Figure 20 - Wall Mounting Assembly

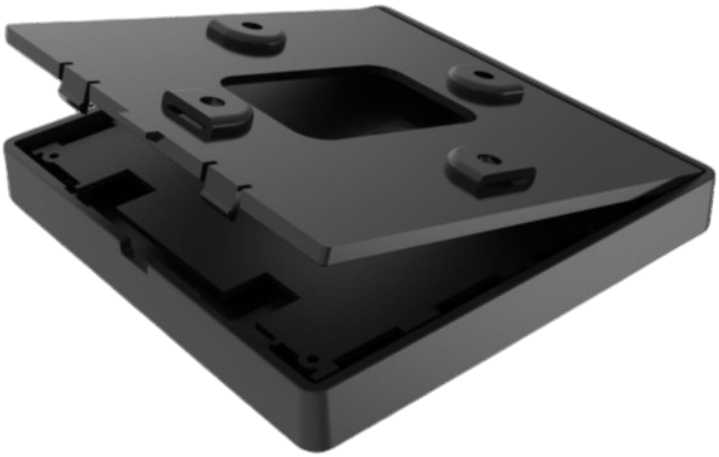


Figure 21 - Wall Box Mount Assembly

Note: Wall mounting, glass mounting, and 86-type electrical box mounting can use the same Rear Cover Mounting Bracket, whereas wall box mounting requires the Wall Box Mounting Bracket.

7 Electrical Specifications

Parameter		MIN	TYP	MAX	UNIT
5VIN	Input voltage range	4.5	5.0	5.5	V
VDD3V3	Output voltage range	3.0	3.3	3.6	V
Icc1_5V	Operating Current: ICT40-4A	-	60	-	mA
Icc2_5V	Operating Current: ICT40-3A	-	50	-	mA
Icc3_5V	Operating Current: ICT40-2A	-	40	-	mA
Icc4_5V	Operating Current: ICT40-1A	-	30	-	mA
V_{OD}	Differential Driver Output Voltage RL = ∞, I_O=0mA, V_{CC}=4.5V (Figure 22) RL = 27Ω, V_{CC}=4.5V (Figure 22) RL = 50Ω, V_{CC}=4.5V (Figure 22)	- 1.5 2	- - -	V_{CC} V_{CC} V_{CC}	V
ΔV_{OD}	Change in Magnitude of Driver Differential VOUT for Complementary Output States RL = 27Ω or R = 50Ω (Figure 22)	-	-	0.2	V
V_{OC}	Driver Common-Mode VOUT RL = 27Ω or R = 50Ω (Figure 22)	-	-	3	V
ΔV_{OC}	Change in Magnitude of Driver Common-Mode VOUT for Complementary Output States RL = 27Ω or R = 50Ω (Figure 22)	-	-	0.2	V
Temp	Operating Temperature	0	-	+70	℃

Table 8 - Operating Voltage and Current

TEST CIRCUITS

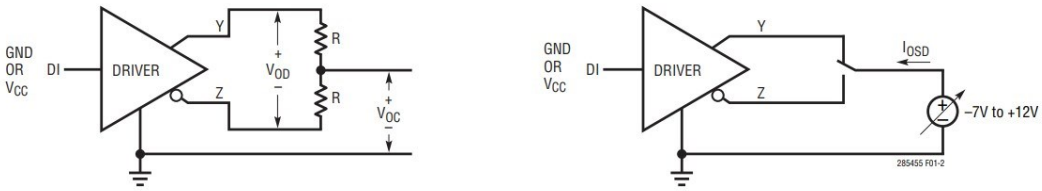


Figure 22 - DC Driver Test Circuits

8 Mechanical Dimensions

All dimensions are in millimetres.

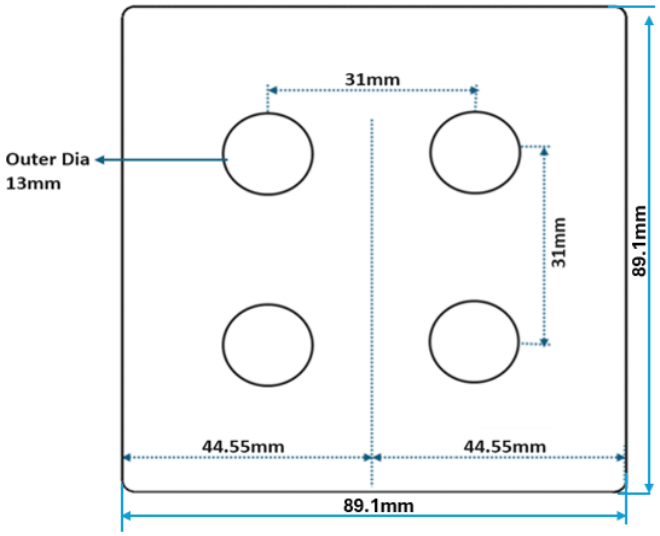


Figure 23 - ICT-040X-04A Dimension (Front View)

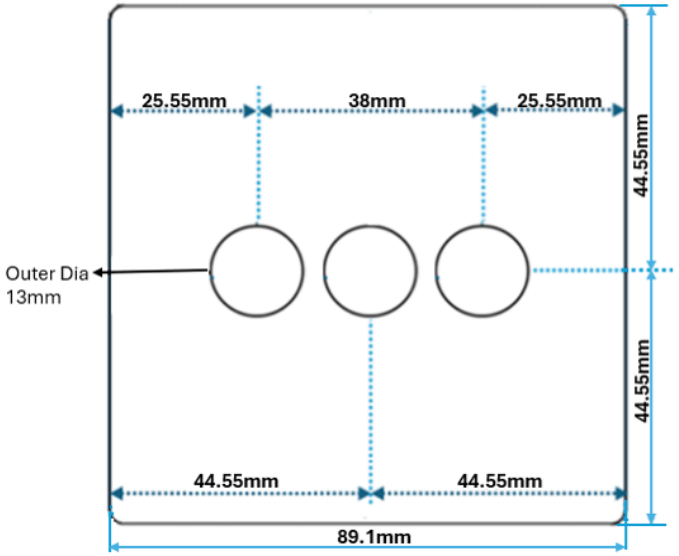


Figure 24 - ICT-040X-04A Dimension (Front View)

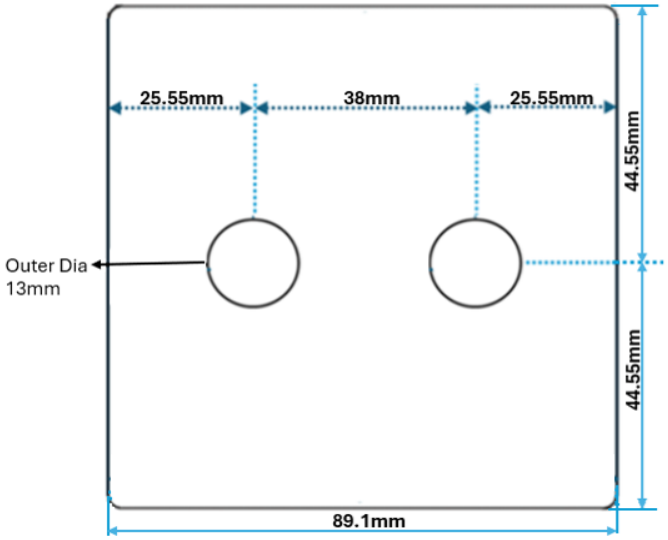


Figure 25 - ICT-040X-04A Dimension (Front View)

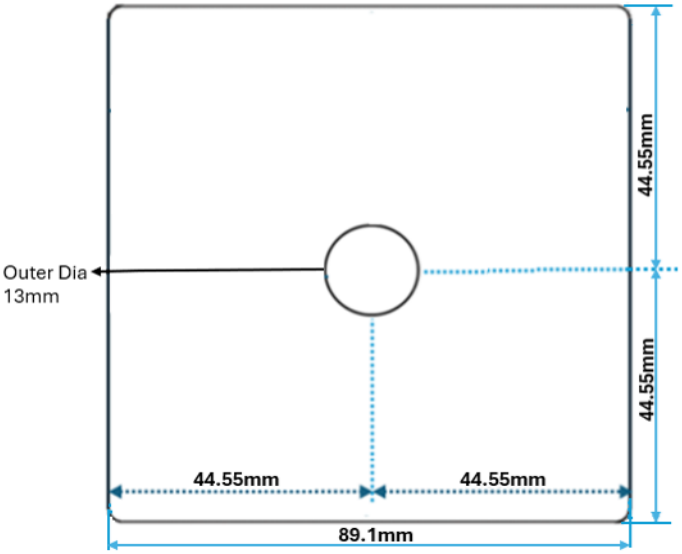


Figure 26 - ICT-040X-04A Dimension (Front View)

Figure 27 – ICT-040X-04A Dimension (Side View)

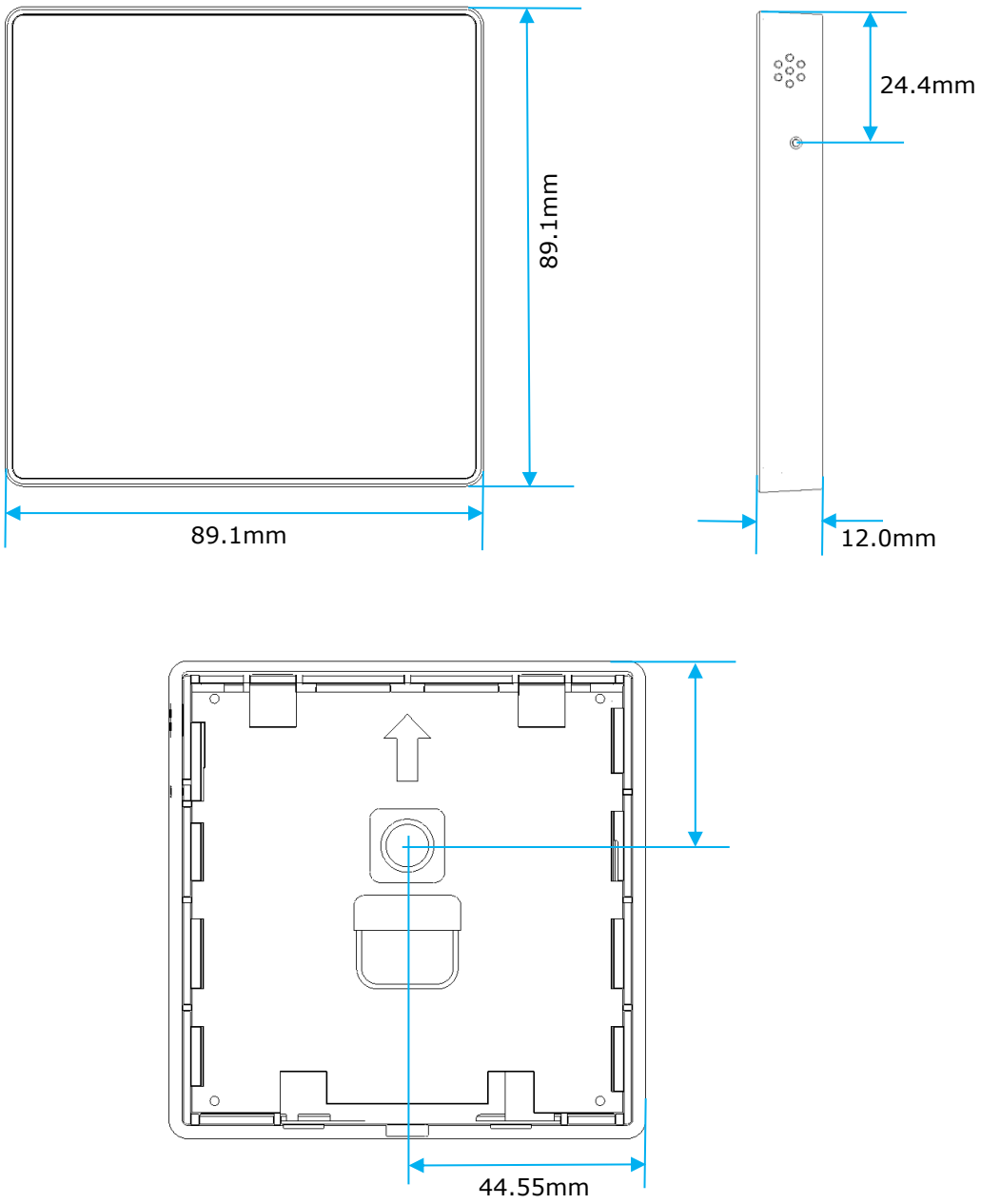


Figure 28 - ICT-040X-04A Body Dimensions

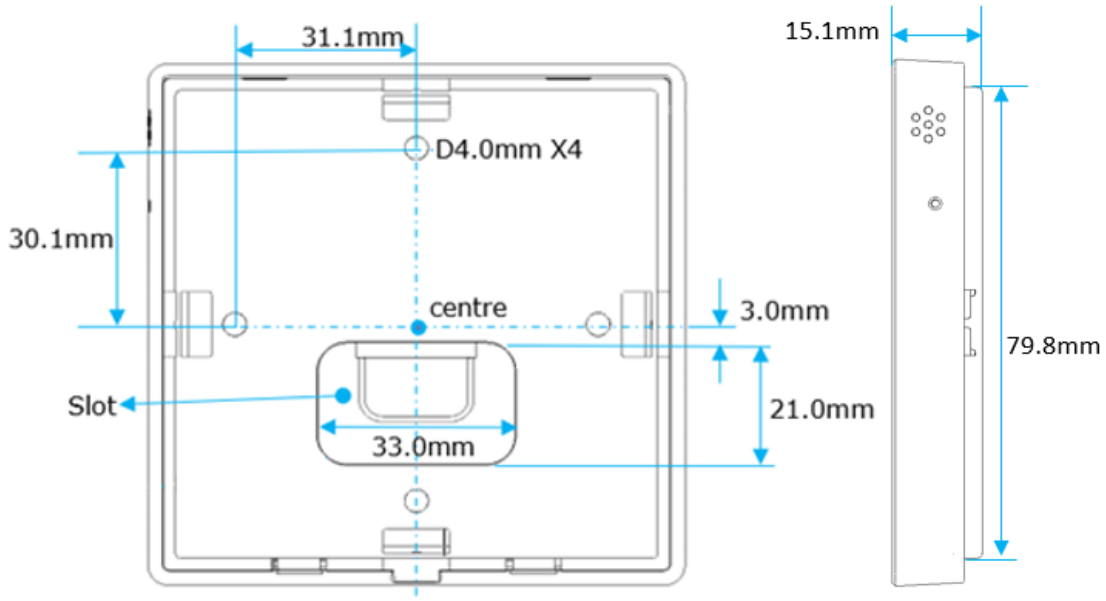


Figure 29 - Rear Cover's Slots and Screw Holes Drawings (Back and Side View)

The above picture illustrates:

a. The dimensions of the slots and screw holes on rear cover, as measured from rear cover's centre.
b. The dimensions of device when fitted with the rear cover.

9 Disclaimer Notice: Use of Third-Party Software or Websites

We may recommend use of software or web sites that are owned or operated by other companies. We offer or facilitate this recommendation by hyperlinks or other methods to aid your access to the third-party resource. While we endeavour to direct you to helpful, trustworthy resources, we cannot endorse, approve, or guarantee software, information, products, or services provided by or at a third-party resource or track changes in the resource. Thus, we are not responsible for the content or accuracy of any third-party resource or for any loss or damage of any sort resulting from the use of, or for any failure of, products or services provided at or from a third party resource.

We recommend these resources on an "as is" basis. When you use a third party resource, you will be subject to its terms and licenses and no longer be protected by our privacy policy or security practices, which may differ from the third policy or practices or other terms. You should familiarize yourself with any license or use terms of, and the privacy policy and security practices of, the third party resource, which will govern your use of that resource.

10 Warranty Statement

According to our after-sales policy, the warranty (if applicable) will be void under the following circumstances:

- The device has been damaged due to human factors, such as dropping, impact, water exposure, or unauthorized disassembly/modification
- The device has malfunctioned due to improper use, mishandling, or usage beyond its intended design.
- The device has been disassembled, repaired, or modified by unauthorized personnel.
- Any other conditions that do not comply with our warranty policy.

11 Contact Information

Refer to https://brtchip.com/contact-us/ for contact information.

Distributor and Sales Representatives

Please visit the Distribution Network – IC & Module (brtchip.com) page for the contact details of our distributor(s) and sales representative(s) in your country.

Appendix A – References

Document References

EFM8BB2 Datasheet

CY8CMBR3108 Datasheet

LP5024 Datasheet

Acronyms and Abbreviations

Terms	Description
CSD	Capacitive Sigma-Delta
CTP	Capacitive Touch Panel
DC	Direct Current
I2C	Inter-Integrated Circuit
JST	Japan Solderless Terminal
LED	Light Emitting Diode
MCU	Microcontroller
PCA	Programmable Counter Array
PCB	Printed Circuit Board
PCBA	Printed Circuit Board Assembly
PWM	Pulse Width Modulation
RJ12	Registered Jack 12
RS485	Recommended Standard #485
SMBus	System Management Bus
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver-Transmitter

Appendix B – List of Tables & Figures

List of Tables

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Appendix C – Revision History

Document Title: ICT-040XA Series Capacitive Touch Panels Datasheet

Document Reference No.: BRT_000452

Clearance No.: BRT#230

Product Page: https://brtchip.com/product/ict-040x-04a-ctp/

Document Feedback: Send Feedback

Revision	Changes	Date
Version 1.0	Initial Release	07-04-2025